

**General Conformity Review and Emission Inventory
Delaware Bay Oyster Restoration Project
April 2007**

The 1990 Clean Air Act Amendments include the provision of Federal Conformity, which is a regulation that ensures that Federal Actions conform to a nonattainment area's State Implementation Plan (SIP) thus not adversely impacting the area's progress toward attaining the National Ambient Air Quality Standards (NAAQS). In the case of the Delaware Bay Oyster Restoration Project, the Federal Action is to plant shell on existing oyster beds at several locations in Delaware Bay (States of Delaware and New Jersey). Another component of the project is to transplant adult oysters and oyster spat to areas in the bay more conducive to oyster success. The U.S. Army Corps of Engineers, Philadelphia District would be responsible for construction. Delaware Bay, New Jersey and Delaware within which the Federal Action will take place is classified as moderate nonattainment for ozone (oxides of nitrogen [NO_x] and volatile organic compounds [VOCs]). Delaware Bay, New Jersey and Delaware is within the Philadelphia-Wilmington-Trenton Nonattainment Area (PA-NJ-DE-MD).

There are two types of Federal Conformity: Transportation Conformity and General Conformity (GC). Transportation Conformity does not apply to this project because the project would not be funded with Federal Highway Administration money and it does not impact the on-road transportation system. GC however is applicable. Therefore, the total direct and indirect emissions associated with the Delaware Bay Oyster Restoration Project must be compared to the GC trigger levels presented below.

Pollutant	General Conformity Trigger Levels (tons per year)
NO _x	100
VOCs	50

To conduct a general conformity review and emission inventory for the Delaware Bay Oyster Restoration Project, a list of equipment necessary for construction was identified. Pertinent pieces of equipment include: tug boats, pump engines to power water cannons and a suction dredge. Table 1 lists these pieces of equipment along with the number of engines, engine size (hp), and duration of operation. A Load Factor (LF) was also selected for each engine, which represents the average percentage of rated horsepower used during a source's operational profile. Load factors were taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project.

Table 1 shows the estimated hp-hr required for each equipment/engine category. Hp-hr was calculated using the following equation:

$$\text{hp-hr} = \# \text{ of engines} * \text{hp} * \text{LF} * \text{hrs/day} * \text{days of operation}$$

The second calculation is to derive the total amount of emissions generated from each equipment/engine category by multiplying the power demand (hp-hr) by an emission factor (g/hp-hr). The following equations were used:

$$\text{emissions (g)} = \text{power demand (hp-hr)} * \text{emission factor (g/hp-hr)}$$

$$\text{emissions (tons)} = \text{emissions (g)} * (1 \text{ ton}/907200 \text{ g})$$

Conservative values for the NO_x and VOC emission factors were selected for the equipment/engine categories. These factors were taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. Tables 2 and 3 present the emission estimates for NO_x and VOCs, respectively. The tables present the emissions from each individual equipment/engine category and the combined total. Table 4 estimates emissions associated with workers driving to and from the work site each day over the course of the construction period.

The total estimated emissions that would result from construction of the Delaware Bay Oyster Restoration Project are 1.85 tons of NO_x and 0.29 tons of VOCs. These emissions are below the General Conformity trigger levels of 100 tons per year for NO_x and 50 tons per year for VOCs. General Conformity under the Clean Air Act, Section 176 has been evaluated for the project according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project because the total direct and indirect emissions from the project are below the conformity threshold values established at 40 CFR 93.153 (b) for ozone (NO_x and VOCs) in a Moderate Nonattainment Area (100 tons NO_x and 50 tons VOCs per year). The project is not considered regionally significant under 40 CFR 93.153 (i).

General Conformity Review and Emission Inventory for the Delaware Bay Oyster Restoration Project

Table 1. Project Emission Sources and Estimated Power

$$\text{hp-hr} = \# \text{ of engines} * \text{hp} * \text{LF} * \text{hrs of operation}$$

Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile.

Equipment/Engine Category	# of engines	hp	LF	hrs of operation	hp-hr
Tug Boat Prime Engine	1	1000	0.40	96	38400
Tug Boat Prime Engine	1	1000	0.40	96	38400
Tug Boat Auxiliary Engine	1	175	0.20	96	3360
Tug Boat Auxiliary Engine	1	175	0.20	96	3360
Water Cannon Pump Engine	1	400	0.50	96	19200
Water Cannon Pump Engine	1	400	0.62	96	23808
Suction Dredge for Delineation	1	320	0.50	96	15360
Suction Dredge for Planting	1	320	0.62	112	22221
Suction Dredge for Reharvesting	1	320	0.43	112	15411

Load Factors taken from the General Conformity Review and Emission Inventory for the Delaware River Main Channel Deepening Project. (May 2003). Prepared for the U.S. Army Corps of Engineers, Philadelphia District by Moffatt & Nichol Engineers.

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Table 2. Emission Estimates (NOx)

Emissions (g) = Power Demand (hp-hr) * Emission Factor (g/hp-hr)

Emissions (tons) = Emissions (g) * (1 ton/907200 g)

NOx Emissions Factor for Off-Road Construction Equipment is 9.20 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
Tug Boat Prime Engine	38400	9.20	0.39
Tug Boat Prime Engine	38400	9.20	0.39
Tug Boat Auxiliary Engine	3360	9.20	0.03
Tug Boat Auxiliary Engine	3360	9.20	0.03
Water Cannon Pump Engine	19200	9.20	0.19
Water Cannon Pump Engine	23808	9.20	0.24
Suction Dredge for Delineation	15360	9.20	0.16
Suction Dredge for Planting	22221	9.20	0.23
Suction Dredge for Reharvesting	15411	9.20	0.16
Total NOx Project Emissions (tons) =			1.82

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Table 3. Emission Estimates (VOCs)

$$\text{Emissions (g)} = \text{Power Demand (hp-hr)} * \text{Emission Factor (g/hp-hr)}$$

$$\text{Emissions (tons)} = \text{Emissions (g)} * (1 \text{ ton}/907200 \text{ g})$$

VOC Emissions Factor for Off-Road Construction Equipment is 1.30 g/hp-hr

Equipment/Engine Category	hp-hr	EF (g/hp-hr)	Emissions (tons)
Tug Boat Prime Engine	38400	1.30	0.06
Tug Boat Prime Engine	38400	1.30	0.06
Tug Boat Auxiliary Engine	3360	1.30	0.005
Tug Boat Auxiliary Engine	3360	1.30	0.005
Water Cannon Pump Engine	19200	1.30	0.03
Water Cannon Pump Engine	23808	1.30	0.0341
Suction Dredge for Delineation	15360	1.30	0.02
Suction Dredge for Planting	22221	1.30	0.03

Suction Dredge for Reharvesting	15411	1.30	0.02
	Total VOCs Project Emissions (tons) =		0.26

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Table 4. Pollutant Emissions from Employee Vehicles

Assumptions:

- Average trip distance (1 way) is 25 miles.
- Average NOx vehicle emission factor is 0.96 g/mile.
- Average VOC vehicle emission factor is 0.84 g/mile.
- Work crew comprised of 12 people
- Every member of the work crew drives their own vehicle.
- Project construction period is 46 days..

Actual work days = 46 days

NOx Calculation: $12 \text{ workers} * 2 \text{ trips/work day} * 46 \text{ work days} * 25 \text{ miles/trip} * 0.96 \text{ g of NOx/mile}$

Total NOx resulting from employee vehicles = 0.03 tons.

VOC Calculation: 12 workers * 2 trips/work day * 46 work days * 25 miles/trip * 0.84 g of VOC/mile

Total VOCs resulting from employee vehicles = 0.03 tons.

Pollutant emissions associated with employee vehicles derived from data found in: Marine and Land-Based Mobile Source Emission Estimates for 50-Foot Deepening Project. January 2002. Prepared for The Port Authority of New York and New Jersey by Killam Associates and Starcrest Consulting Group, LLC.